REMARKS

Claims 1-20 are pending in the application. Reconsideration and allowance in view of the following remarks are respectfully requested. Applicant believes that the application is now in condition for allowance and notice thereof is respectfully requested.

The Rejection of Claim 16 is Unclear

On page 7, the Office Action rejects claim 16 based on the teachings of Stack. That is, the Office Action, in the rejection of claim 16, appears to rely solely on the teachings of Stack. However, on page 2, the Office Action appears to rely on both Stack and Spoerre in asserting the basis of the rejection of claim 16.

Accordingly, the basis of the rejection of claim 16 is unclear. The Examiner is requested to clarify the basis of the rejection of claim 16 in the next Office Action, such that Applicant might study the merit of such asserted rejection.

I. The 35 U.S.C. §103 Rejection Based on Stack and Spoerre

In the Office Action, claims 1-2, 4-7, 9-12, 14-17 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable by Stack et al (U.S. PGPUB 2004/0102864), further in view of Spoerre et al (U.S. Pat 5,602,761). This rejection is respectfully traversed.

Claim 1 recites a system for analyzing an anomalous condition, comprising a process for producing a product, including plural subprocesses for performing operations on the product, wherein each subprocess includes at least one actuator for controlling the respective subprocess, wherein each subprocess includes at least one sensor for measuring information pertaining to the status of the respective subprocess, and for generating an output based thereon. The claimed process is claimed in conjunction with a parameter extractor for, for each of the subprocesses, receiving the output from the at least one sensor, and for generating at least one representative value that is characteristic of a pattern expressed in the output, the

parameter extractor thus generating a plurality of representative values for the process as a whole. Claim 1 further recites a knowledge base for storing data including the plurality of representative values, and also including information which maps the representative values to associated anomalous conditions.

In the Office Action, with reference to claim 1, the Office Action asserts that Stack teaches a system for analyzing an anomalous condition, comprising a process for producing a product, including plural subprocesses for performing operations on the product (Paragraph 0006, lines 13-16), wherein each subprocess includes at least one actuator for controlling the respective subprocess (Paragraph 0059), wherein each subprocess includes at least one sensor for measuring information pertaining to the status of the respective subprocess, and for generating an output based thereon (Paragraph 0006, lines 13-16 and Paragraph 0033); and a parameter extractor for, for each of the subprocesses, receiving the output from the at least one sensor (Paragraph 0036). On page 2, last line - page 3, line 8, the Office Action describes further asserted teachings of Stack.

In acknowledging asserted deficiencies of Stack, the Office Action asserts that, however, Stack does not explicitly teach generating at least one representative value that is characteristic of a pattern expressed in the output, the parameter extractor thus generating a plurality of representative values for the process as a whole, nor that the knowledge base stores data including a plurality of representative values, and also including information which maps the representative values to associated anomalous conditions and an analyzer for analyzing the plurality of representative values output from the parameter extractor with respect to the data stored in the knowledge base.

The Office Action attempts to cure the deficiencies of Stack with the teachings of Spoerre. That is, the Office Action asserts that Spoerre teaches a system for analyzing

anomalous conditions which collects sensor readings and creates RMS or averaged data (col. 5 line 27 through col. 6 line 7), and which then takes the data and checks it against a knowledge base which determines faults (col. 6 line 56 through col. 7 line 8).

The Office Action then concludes that it would have been obvious to one skilled in the art at the time the invention was made to generate at least one representative value that is characteristic of a pattern expressed in the output, and to map those values to associated anomalous conditions in the invention taught by Stack above since this would allow critical machine components to be monitored and possibly replaced when an abnormality occurs, which would increase the life of machine tools due to the minimization of stress under high machine vibrations. By such assertions, Applicant assumes that Spoerre is asserted to provide such teachings, although the Office Action does not expressly state such. Such implied assertions are traversed as being unsupportable.

Applicant submits that Stack, alone or in conjunction with Spoerre, fails to teach or suggest the features relating to "generating at least one representative value that is characteristic of a pattern expressed in the output", and the interrelationship thereof with the other claimed features.

Focusing initially on the teachings of Stack, Stack relates to a system and method for high speed control and rejection of out-of-specification products, such as cigarettes, in a manufacturing process. In the Abstract, Stack describes that sensors are placed at strategic locations along a production line, with the signals from the sensors being directed to a high speed processor, with multiple sensor inputs and controlled by software algorithms to process the sensor signals and to direct control signals to the production line equipment. Control signals can both eject non-conforming products and also modify machine settings to produce a product in closer compliance with specifications.

Stack further describes that in addition to the preferred rejection control feature, exemplary embodiments can also provide machine control of the machine 200 based on signals received by one or more sensors, such as those located at positions 112, 210, and 212. Stack teaches that for example, an algorithm on the processor 201 can receive the weight measurement signals from sensor 112 and can analyze a trend in individual weight measurements to determine if the ecreteur wheel 114 needs adjustment or replacement. Stack explains that if the weight measurements are regularly too high, a control signal can be sent from the processor 201 across the communication path 202 to the machine 200 to instruct a gear box to raise the ecreteur wheel 114 to scrape more tobacco off the continuous rod. If, on the other hand, the measurement signals from sensor 112 to the processor 201 indicate that every sixth cigarette rod is too heavy in the middle of the cigarette rod, and if the scalloped ecreteur wheel 114 provides for the scraping of the equivalent of six cigarette rods during one revolution of the wheel, a message can be displayed on a screen or graphical user interface 204 or 206 to instruct the operator to replace the ecreteur wheel as having at least one improperly shaped edge.

It is respectfully submitted that the teachings of the applied art fail to teach the claimed invention as recited in claim 1, and in particular, the features of claim 1 relating to the parameter extractor and the generation of the at least one representative value, and the manipulation thereof.

The Office Action relies on the teachings of Spoerre to cure the deficiencies of Stack. Spoerre is directed to a machine performance monitoring and fault classification using an exponentially weighted moving average scheme. In column 4, lines 1-12, Spoerre describes a system and method for monitoring and diagnosing a machine condition. The system and method includes collecting a first set of data from a machine during operation. The first set of

data is indicative of the machine under normal machine conditions. An AR order is selected for the normal machine condition, and an AR model is generated from the first set of data collected from the machine. The AR model has a first order parameters, second order parameters, and p order parameters.

In column 4, lines 13-34, Spoerre further describes that an average value for the first order AR parameter through a pth order AR parameter from the AR model is calculated in order to define a normal model that is representative of the normal machine condition. Then, a second set of data is collected from a machine under diagnosis. The second set of data is representative of an current machine condition. The second set of data is fitted to the normal model to generate a fitted model, wherein the fitted model is an indicator of how closely the normal model fits the second set of data.

In column 4, Spoerre further teaches that forward and backward prediction errors are calculated to determine a $\rho_{normalized}^{fb}$ value for the second set of data. An exponentially weighted moving average (EWMA) statistic based on the $\rho_{normalized}^{fb}$ value is then calculated, wherein the EWMA statistic is an indicator of the overall machine condition. The EWMA statistic is compared to an upper control limit to determine if the machine under diagnosis is in a state of control or is a state of out-of-control. Spoerre describes that if the EWMA statistic exceeds the upper control limit this is a signal that an abnormal machine condition exists in the machine under diagnosis. Spoerre further describes this feature in column 17, lines 47-51.

The Office Action specifically refers to column 5, line 27-column 6, line 7. Therein, Spoerre discloses further features of the Spoerre invention. Of such teachings of Spoerre, Applicant notes in particular column 5, line 57 - column 6, line 7. Therein, Spoerre teaches diagnostic system 100 preprocesses sensory inputs, such as vibration and sound, using an

autoregressive (AR) model. Once the data is processed, the fault diagnostics can be carried out in three different levels, as shown in FIG. 8. At the fault detection level 810, indices based on an overall root mean square (RMS) measurement and a covariance statistic of an exponentially weighted moving average (EWMA) method are used to detect an abnormal machine condition on-line. Spoerre reflects EWMA is described in Spoerre, J. K., "Machine Performance Monitoring and Fault Classification Using an Exponentially Moving Average Scheme," Masters Thesis, The University of Iowa, May 1993.

Spoerre further describes that a control limit is set for each RMS or EWMA index. An abnormal condition is detected whenever the RMS or EWMA measurement of new sensory data exceeds a respective control limit. The sensory data are then transferred to the fault identification level 820 for further analysis. Spoerre comments that RMS is well known in the art.

Claim 1 includes the feature of the parameter extractor generating at least one representative value that is characteristic of a pattern expressed in the output. Accordingly, claim 1 recites an association between the representative value and a pattern. Claim 1 then recites further manipulation of such representative value. That is, the representative values are then processed by the knowledge base and the analyzer, as claimed. In particular, it is this interrelationship that Stack and/or Spoerre fail to teach or suggest.

The Office Action acknowledges that Stack does not disclose such feature as recited in claim 1. Applicant further submits that Spoerre fails to teach such feature, even if Stack and Spoerre were somehow combined (which it is not admitted as being obvious). As discussed above and reflected in Spoerre (column 6, line 3), Spoerre relates to the manipulation of RMS and EWMA measurements. Applicant submits that such teachings fail to teach the claimed

invention and the manipulation of the at least one representative value that is characteristic of a pattern expressed in the output, as recited in claim 1.

The deficiencies of the applied art are emphasized by Spoerre's teachings in column 7, lines 53-65. Therein, Spoerre teaches that if a model is suitable, a vibration signal will be defined to a large degree by the model and the deviations, or residuals, of the predicted signal from the actual signal for each point in time are distributed as white Gaussian noise and, therefore, randomly distributed about the mean value zero. Of particular note, Spoerre teaches if the stochastic component is white noise and the trend in the vibration signal is adequately modeled, a plot of the residuals over time is expected to exhibit a rectangular scatter plot with *no discernible pattern*, meaning the variance is constant. Spoerre reflects this anticipated random distribution of the residuals is apparent in the plot of the residuals over time for a set of data representing a normal machine condition, as shown in FIG. 3. Such teaching of Spoerre appears fundamentally different than the claimed invention as set forth in independent claim 1.

Accordingly, it is respectfully submitted that claim 1 defines patentable subject matter for at least the reasons set forth above. Further, it is submitted that independent claims 6, 11, and 16 define patentable subject matter for reasons similar to those set forth with respect to claim 1.[1]

Further, the various rejected dependent claims define patentable subject matter based on their various dependencies on the independent claims, as well as the additional features such dependent claims recite. Withdrawal of the rejection under 35 U.S.C. §103 is respectfully requested.

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[1] However, as noted above, the rejection of claim 16, as set forth in the Office Action, is unclear.

II. <u>The Further 35 U.S.C. §103 Rejection</u>

In the Office Action, claims 3, 8, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stack and Spoerre, and further in view of Isobe et al (U.S. Pat 6,068,887).

The Office Action, referring to such claims, asserts that Stack and Spoerre teach the above; but however, Stack and does not explicitly teach that the process is for manufacturing metal products, and that the process includes a hot rolling subprocess for reducing the thickness of the metal products in a heated state, a pickling subprocess for removing unwanted material from the metal products, a cold rolling subprocess for reducing the thickness of the metal products in a cold state using a plurality of rolling stands, and an annealing subprocess for heating and subsequently cooling the metal product.

The Office Action then asserts that Isobe teaches a process for producing steel which utilizes hot rolling, pickling, cold rolling and annealing in order to produce the product (col. 1 lines 13-31). The Office Action concludes that therefore, it would have been obvious to one skilled in the art at the time the invention was made to utilize manufacturing metal products using the process taught by Isobe in the invention taught by Stack, and as modified by Spoerre, since the steps of hot rolling, pickling, cold rolling and annealing are well known in the art of producing steel sheets (Isobe, col. 1 lines 13-31), and since Stack teaches that exemplary embodiments of the invention can be implemented on any manufacturing devices (Stack, Paragraph 0029).

Applicant respectfully submits that Isobe fails to cure the deficiencies of Stack as discussed above. That is, even if it were obvious to somehow apply the teachings of Stack and Spoerre to the processes as described by Isobe, such modification of the applied art would still fail to teach or suggest the features as recited in claim 1 and the other independent

claims.

Accordingly, since claims 3, 8, 13 and 18 variously depend on such independent claims, it is submitted that claims 3, 8, 13 and 18 define patentable subject matter in light of their dependencies, as well as the additional subject matter such dependent claims recite.

Withdrawal of the rejection under 35 U.S.C. §103 is respectfully submitted.

III. CONCLUSION

For at least the reasons outlined above, Applicant respectfully asserts that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are respectfully solicited.

Should the Examiner believe anything further is desirable in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number listed below.

For any fees due in connection with filing this Response the Commissioner is hereby authorized to charge the undersigned's Deposit Account No. 50-0206.

Respectfully submitted,
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